

**NATURAL RESOURCES CONSERVATION SERVICE**  
**VIRGINIA CONSERVATION PRACTICE STANDARD**  
**TREE/SHRUB ESTABLISHMENT**

(Acre)

**Code 612**

**DEFINITION**

Establishing woody plants by planting seedlings or cuttings, direct seeding, or natural regeneration.

Seedlings will be properly protected and stored from nursery through planting.

Only viable, high quality, and adapted planting stock or seed will be used.

Site preparation shall be sufficient for establishment and growth of selected species.

**PURPOSES**

To establish woody plants for forest products, wildlife habitat, long-term erosion control and water quality improvement, waste treatment, air pollution reduction, carbon sequestration, energy conservation, aesthetic or visual enhancement and sound barriers.

Adequate seed for advanced reproduction needs to be present or provided for when using natural regeneration to establish a stand.

The acceptability and timing of coppice regeneration shall be based on species, age, and diameter.

**CONDITIONS WHERE PRACTICE APPLIES**

On any area where woody plants can be grown.

Timing and use of planting equipment will be appropriate for the site and soil conditions.

The planting will be protected from unacceptable adverse impacts from pests, wildlife, livestock damage, or fire.

**CRITERIA**

**GENERAL CRITERIA APPLICABLE TO ALL PURPOSES**

Species will be adapted to soil and site conditions and suitable for the planned purpose(s).

Shelters, tubes, mulching (mats), or herbicides will be needed on hardwood sites to assure adequate survival and growth.

Comply with applicable federal, state, and local laws and regulations during the installation, operation, and maintenance of this practice.

Planting or seeding rates will be adequate to accomplish the planned purpose.

Selection of appropriate planting dates and care in handling and planting of the seeds, cuttings, or seedlings will ensure that planted materials have an acceptable rate of survival.

**CONSIDERATIONS**

The owner's choice of species to plant will be determined by the program requirements, the products desired and the existing soil and site

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

conditions, or by the desirable species in existing understocked stands.

When underplanting, trees should be planted sufficiently in advance of overstory removal to ensure full establishment.

Use locally adapted seed, seedlings, or cuttings. Priority will be given to plant materials that have been selected and tested in tree/shrub improvement programs. All plant materials should comply with a minimum standard as provided by the Virginia Department of Forestry.

Consideration should be given to selecting species that are native and best meet wildlife needs. Selection of indigenous species may improve or restore natural diversity.

Plants for landscape and beautification plantings should consider stem, foliage and flower color, texture and shape, season, and mature plant height.

Tree/shrub arrangement and spacing should allow for and anticipate the need for future access lanes for purposes of stand management.

Residual chemical carryover should be evaluated prior to planting.

Species considered locally invasive or noxious should not be used.

Species used to treat waste should have fast growth characteristics, extensive root systems, high nutrient uptake capability, and produce wood/fiber products in short rotations.

For optimal carbon storage, select plant species that are adapted to the site to assure strong health and vigor and plant the full stocking rate for the site.

Insect and disease infestations should be treated when thresholds are exceeded. Refer to the Virginia Conservation Practice Standard *Pest Management (Code 595)* for more information.

Christmas tree production requires land of suitable quality, adequate area, and careful species selection.

## PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, technical notes, narrative statements in the conservation plan, or other acceptable documentation.

Plans and specifications will include the following:

- Adapted tree species for the purposes outlined
- Spacing and planting methods
- Cultural practices
- Maintenance requirements
- Variations in methods and species between interplanting, underplanting, and planting in open areas.

Separate specifications can be prepared for each of the planting methods.

References may be made to planting specifications prepared by the Virginia Department of Forestry that covers each needed component listed above.

## PLANTING ADAPTED SPECIES

Refer to the [Plant Establishment Guide for Virginia](#) for a list of native trees and shrubs.

Another source for choosing trees or shrubs is the Soil Survey Interpretations – Woodland Suitability for Individual Soil Series in Section II of the [Virginia Field Office Technical Guide](#).

Also, the Virginia Department of Forestry publishes an annual Seed Catalogue that lists native species and their uses.

Recommendations made by the Virginia Department of Game and Inland Fisheries are also acceptable.

## SITE PREPARATION

The objective of site preparation is to reduce competition without removing or destroying

topsoil and organic matter. For more information about site preparation, refer to Virginia Conservation Practice Standard *Forest Site Preparation (Code 490)*.

Site Preparation is also discussed in Forestry Technical Note #3, Tree and Shrub Establishment Guidelines.

## SPACING RECOMMENDATIONS

Tables 1 and 2 list pine and hardwood species recommended by general site and soil characteristics. Table 3 has the number of plants per acre needed at different spacing guidelines and is useful for ordering the number of plants needed. Use the Plant Establishment Guide for Virginia for spacing recommendations for program requirements. Spacing recommendations for other purposes can vary considerably depending on landowner's objectives, species, site conditions and many other factors. Therefore, specific spacing recommendations should be obtained from the Virginia Department of Forestry, Virginia Department of Game and Inland Fisheries or from a forestry consultant or professional forester.

In Virginia for Land Use Assessment Tax purposes at least 400 trees per acre are necessary.

In general, 300 trees per acre is the minimum recommendation for hardwoods, but hardwood recommendations are site specific and a forester should be consulted before planting for any purpose.

## PLANTING METHODS

Any number of methods using seeds, seedlings, cuttings and regeneration can accomplish reforestation (establishing trees after a timber harvest) or afforestation (starting a new forest or plantation). For more information about plant establishment refer to Forestry Technical Note #3, Tree and Shrub Establishment Guidelines.

The following methods of establishment are used for forest products, erosion control, water quality improvement, air pollution reduction and carbon sequestration.

### Seedlings

Seedlings may be planted by hand planting or machine planting.

**Table 1: Recommended Conifer Species for Reforestation and Afforestation by Region\***

Species	Coastal Plain	Lower Piedmont	Upper Piedmont	Mountains
Loblolly Pine	X <sup>1</sup>	X	X	
Longleaf Pine	X <sup>2</sup>			
Shortleaf Pine <sup>3</sup>	X <sup>1</sup>	X	X	X <sup>4</sup>
Virginia Pine <sup>5</sup>			X	X
Eastern Redcedar	X	X	X	
Eastern White Pine <sup>6</sup>			X	X
Fraser Fir <sup>7</sup>				X
Red Spruce <sup>7</sup>				X

1 Not recommended on sands over 30" in depth.

2. Best species for sands over 30" in depth.

3. Adapted to dry, infertile soils.

4. Recommended up to 2,500 feet elevation.

5. Adapted to severely eroded soils and disturbed sites.

6. Should not be planted on heavy clay soils or wet sites.

7. No lower than 2,000 ft elevation, preferably above 4,500 ft elevation.

**Table 2: Recommended Hardwood and Shrub Species for  
Reforestation and Aforestation by Region**

**Coastal Plain Characteristics**

<b>Species</b>	<b>Well Drained Deep, Rich (River Terrace)</b>	<b>Heavy, Somewhat Wet Soils (Mineral Soils)</b>	<b>Very Poorly Drained Permanently Wet Soils w/ Clay Base Muck or Peat</b>	<b>Shallow, Sandy Loamy Soils Over Clay Base (&gt;6" Topsoil)</b>
Ash				
Black Ash				X
Green Ash	X	X		X
White Ash	X			
Bald Cypress		X	X	X
Beech	X			
Black Gum (Tupelo)		X	X	
Black Walnut	X			
Black Willow		X	X	
Cedar				
Atlantic White Cedar			X	
Chokecherry		X	X	
Common Buttonbush	X	X		
Cottonwood	X			
Dogwoods	X			
Hazel Alder	X	X		
Hickories				
Mockernut	X	X		
Pignut				
Indigobush	X	X		X
Oaks				
Red				
Black Oak	X	X		
Northern Red Oak	X			
Cherrybark	X			
Pin Oak		X	X	
White				
Overcup Oak	X	X	X	X
Water Oak	X	X		
White Oak	X	X		
Willow Oak	X	X		
Persimmon	X			
Red Maple	X	X	X	
Red Mulberry	X			
River Birch	X	X		
Service-berry		X	X	X
Sweetgum	X	X		
Swamp Tupelo				X
Sycamore	X			X
Waxmyrtle (Bayberry)		X	X	
Yellow Poplar	X	X		

**Table 2 Continued**  
**Piedmont Characteristics**

<b>Species</b>	<b>Loamy, Clayey, Red, Droughty, (Eroded)</b>	<b>Upland Slopes &amp; Ridges; Deep, Loamy Soil (Little Erosion)</b>	<b>Small Stream Bottom (Variable)</b>	<b>Major River Bottoms (River Terraces)</b>
Ash				
Green Ash			X	X
White Ash		X		X
Beech			X	
Black Gum (Tupelo)			X	
Black Walnut		X		
Black Willow			X	X
Common Apple		X		
Common Buttonbush			X	X
Cottonwood			X	X
Dogwoods		X		
Eastern Redbud		X	X	
Eastern Red Cedar	X	X		
Hackberry			X	
Hazel Alder			X	X
Hazelnut			X	X
Hawthorne		X	X	
Hickories				
Mockernut	X	X		
Pignut	X	X	X	
Indigobush	X		X	
Oaks				
Red				
Black Oak	X	X		
Cherrybark Oak			X	X
Chestnut	X			
Northern Red Oak		X		
Pin Oak			X	X
Southern Red Oak		X		
White				
Overcup Oak			X	X
Water Oak			X	X
White Oak		X	X	X
Willow Oak			X	X
Persimmon	X	X	X	
Red Maple	X	X	X	X
Red Mulberry			X	
River Birch			X	X
Service-berry			X	X
Sweetgum		X	X	X
Sycamore		X	X	X
VA-70 Lespedeza	X			
Yellow Poplar		X	X	

**Table 2 Continued**  
**High Piedmont & Lower Mountains Characteristics**

<b>Species</b>	<b>Upland Ridges, Rocky, Eroded (Less than 3" topsoil)</b>	<b>Upland Ridges, Deep Soil (less than 50% Rocks)</b>	<b>Coves, Valleys</b>	<b>High Plateau</b>
Beech			X	
Black Gum (Tupelo)			X	
Black Locust		X	X	
Black Walnut			X	
Black Willow			X	
Cherry		X	X	
Common Apple		X		X
Cottonwood			X	
Crab Apple			X	
Dogwoods			X	
Eastern Redbud	X	X		
Eastern Red Cedar	X			X
Hackberry			X	
Hazelnut			X	
Hawthorne			X	
Hickories Mockernut Pignut	X	X	X X	X
Indigobush	X		X	
Oaks Red Bear Oak Black Oak Chestnut Oak Northern Red Oak White Bur Oak White Oak	X  X X X  X	 X X X	 X X X	X
Persimmon	X			
Red Maple	X	X	X	
Red Mulberry			X	
Sycamore			X	
VA-70 Lespedeza	X			X
White Ash			X	
White Walnut (Butternut)		X	X	
Yellow Poplar		X	X	

**Table 3: Number of Trees Required Per Acre at Various Spacings**

5' x 5' = 1,742	6' x 9' = 800	8' x 8' = 675	10' x 10' = 435
6' x 6' = 1,225	6' x 10' = 728	8' x 10' = 545	12' x 12' = 300
6' x 8' = 870	7' x 10' = 622	8' x 12' = 450	20' x 20' = 110

Plant seedlings slightly deeper (1" to 2") than they grew in the nursery in all soils except deep sands where they should be planted 2 to 4 inches deeper than they grew in the nursery, exercising due care not to cover the terminal bud. An exception is longleaf pine. It should be planted with the terminal bud at ground level. Precise placement is crucial for the success of this species.

Roots must be planted straight down, not twisted, balled or U-shaped. The opening (slit, hole, or furrow) should be large and deep enough to accommodate the root system in its normal position.

When using a machine check for proper depth of the trench, correct tracking of packing wheels and proper closure of trench by the packing wheels. Check root placement by opening one side of the trench with a shovel to expose the seedling in place.

Seedling stocking and survival can be determined a year after planting by taking 1/100 acre randomly sampled plots in the plantation. The radius of a 1/100-acre plot is 11.75'. Sufficient plots are needed to give a good representation of area.

As a rule, for timber production, if 300 or more well-established seedlings survive per acre, it will not pay to replant. Replacement plantings should be made within 2 years after the original planting.

For conservation or wildlife purposes, if 70% of the planted trees or shrubs survive 2 years after establishment, replanting is not necessary.

### **Direct Seeding**

#### Seed Quality

Seed should be ordered from a reliable commercial seed dealer. Lots should contain no

more than 10% cull by number and moisture content should be 10% or less. Impurities should be 2% or less by weight.

#### Seed Treatment

Seed stratification and repellent coating are essential for all pines except longleaf. Stratification will hasten germination after sowing, which in turn will reduce the period of exposure to predators and the elements. After stratification, the seed must be coated with a chemical repellent.

The repellent coating is the same for all Southern pine species. It usually consists of one chemical to repel birds and another to repel rodents and many insects. It also includes a substance that sticks the repellent to the seed, plus an aluminum powder to lubricate the seed so they flow through a seeding machine.

Southern pine seeds may be sown directly especially in wet areas where planting by hand or machine is not possible. The recommended rate for some pines are listed below on a pound per acre basis:

Longleaf	3.0
Loblolly	1.0
Shortleaf	0.4
Virginia	0.3
White	0.6

A rate of 10,000 to 15,000 seeds per acre is recommended if seeds are broadcasted.

Direct seeding should not be used on slopes which are steep and eroded because seed can easily be washed away. Also deep, sandy soils should be avoided because they dry out too fast for good seed germination. For direct seeding to work on such sites, the seeds have to be covered with ½ inch of soil – a very time-consuming operation.

## Natural Regeneration

Natural regeneration, using seed trees to re-establish a forest, is used with hardwoods, native pines and yellow poplar on sites that are very steep and sensitive to erosion.

## Cuttings

Cuttings are used to establish cottonwoods, willow, sycamore and alder, particularly on river banks and in riparian areas.

Planted seedlings or cuttings should be released from any overtopping vegetation no later than 2 years after planting. Consult the specifications for Virginia Conservation Practice Standard *Forest Stand Improvement (Code 666)* for applicable methods of treating overtopping vegetation. The "Foliage Spraying" methods should not be used on areas planted to hardwood species.

## SPECIAL PURPOSES

For information about planting trees or shrubs for wildlife habitat refer to *Plant Establishment Guide for Virginia* and the Virginia Conservation Practice Standard *Wildlife Upland Habitat Management (Code 645)*.

For more information about planting trees or shrubs for water quality improvement refer to Virginia Conservation Practice Standards *Streambank and Shoreline Protection (Code 580)* and *Riparian Forest Buffer (Code 392)*. For more information about planting trees or shrubs for waste treatment, air pollution reduction, and aesthetic, visual or sound barriers refer to Virginia Conservation Practice Standard *Windbreak/Shelterbelt Establishment (Code 380)*.

Some species of Christmas trees that can be grown in Virginia follow:

### Coastal Plains

Redcedar  
Virginia Pine  
Eastern White Pine

### Piedmont

Redcedar<sup>1</sup>  
Eastern White Pine  
Virginia Pine

### Mountains

Fraser Fir  
Eastern White Pine  
Virginia Pine<sup>2</sup>

<sup>1</sup> Local sales.

<sup>2</sup> Not generally used in commercial operations

## TIME TO PLANT

Plant during the dormant season. (The season can be extended from two to four weeks by placing dormant seedlings in cold storage.) Avoid planting when ground is frozen or dry or excessively wet and sticky. Planting when soil is in poor condition results in low survival, poor planting production, misplanted seedlings, and poor growth.

## PROTECTION OF PLANTED SEEDLINGS

All plantations should be protected from grazing by livestock until the trees are at least 8 to 10 feet high. Domestic livestock should be completely excluded from all hardwood and Christmas tree plantations throughout the life of the stands. Hogs must be completely excluded from plantations of all species. For further details, consult the specifications for the Virginia Conservation Practice Standard *Fence (Code 382)*.

Young plantations of all species must be protected from fires. See the Specifications for Virginia Conservation Practice Standard *Firebreak (Code 394)*.

## OPERATION AND MAINTENANCE

Competing vegetation will be controlled until the woody plants are established.

Replanting will be required when survival is inadequate.

Trees and shrubs will be protected from fire, insects, disease, and animals until established.



Supplemental watering may be desirable to ensure adequate survival.

Damaging pests will be monitored and controlled.

Periodic applications of nutrients may be needed to maintain plant vigor.

## REFERENCES

1. Zobel, B. J. and C. B. Davey, "A Simplified Guide to Hardwood Management in the Southeast", College of Forest Resources, North Carolina State University, Raleigh, North Carolina.
2. NRCS, Virginia Field Office Technical Guide.
3. "Forestry Best Management Practices for Water Quality" in NRCS, Virginia Field Office Technical Guide.
4. NRCS, *Plant Establishment Guide for Virginia*.
5. NRCS, Virginia Technical Note, Forestry #3, "Tree and Shrub Establishment Guidelines".
6. Burns, Russell M., and Barbara H. Honkala, tech. coords. 1990. *Silvics of North America*: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p. These volumes can be accessed at:  
[http://www.na.fs.fed.us/spfo/pubs/silvics\\_manual/table\\_of\\_contents.htm](http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm)

**NATURAL RESOURCES CONSERVATION SERVICE**  
**VIRGINIA CONSERVATION PRACTICE STANDARD**

**TREE/SHRUB ESTABLISHMENT**

**Approved Practice Narrative**

(Acre)

**CODE 612**

612 D1 Tree/Shrub Establishment: Trees and/or shrubs will be established as per specifications in the attached Forest Management Plan approved by the Virginia Department of Forestry.

612 D3 Tree/Shrub Establishment: Trees and/or shrubs will be established as per specifications in the attached Forest Management Plan written by a professional forester or consultant.

612 D2 Tree/Shrub Establishment: Trees and/or shrubs will be established as per specifications in the program guidance. Specifications will be provided.

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